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FINAL REPORT

RESEARCH ASSOCIATESHIP GRANT 1974-75

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THE MANAGEMENT AND EFFECTIVENESS OF CONSTRUCTION PROJECTS UNDER
INTERNATIONAL DEVELOPMENT PROGRAMMES

A final report to the International Development Research Centre on completion of tenure for a Research Associate Grant.

David G. Hunter, P. Eng.

This report is in two parts:-

Part 1 - A personal report to the IDRC on the activities covered by the research associate grant. This includes details of all work carried out during the period of tenure (of which Part 2 is a final product of a major portion), the sources of information obtained, a bibliography broken down into appropriate headings and an evaluation of the results of the program of study both from a technical and a philosophical standpoint.

Part II - Minimum Cost - Minimum Time - A formal paper covering the engineering, economic and management aspects of construction work in developing countries in general and on international development oriented projects in particular. This paper discusses the various management techniques being employed in a variety of countries, their problems and advantages; it suggests methods of implementation which would appear to minimize delay and make maximum use of available financial, technical, material and manpower resources. This part is a separate report suitable for external distribution and/or publication.

PART I

Containing:

Final Report on period of tenure.

Copies of reports for periods Oct. 1 to Dec. 1, 1974 and
Dec. 1, 1974 to Apr. 1, 1975.

Organizations & persons interviewed or with whom correspondence has been undertaken.

Bibliography by subject:

- International Construction
- Labour Intensive Projects
- Project Evaluation & Administration
- Highways
- Water Supplies & Sewage
- Housing, Sites & Services
- Manpower & Training
- Construction Materials
- Appropriate Technology
- Statistics
- Miscellaneous

PART I

FINAL REPORT ON PERIOD OF TENURE UNDER RESEARCH ASSOCIATE GRANT 1974 - 75

DAVID HUNTER

As stated in my original application for this grant, the main objective of my period of study was to widen my view of the augmentation of construction projects overseas, particularly those built under development aid programmes. My intentions were to offer my services as consultant in this field to engineers, contractors, aid programme organization and others, and I had hoped to use the period of study to rationalize my own ideas on the subject, to learn what I could from the available literature, 'picking the brains' of others who are involved in this type of work and to put these ideas down in the form of a report which may be of use to others interested in this field of activity. I also wished to broaden my knowledge by taking formal courses in political science at the University of British Columbia and night classes in conversational Spanish.

A. Research Programme

Details of the work carried out during the period October 1st, 1974 to December 1st, 1974 and from December 1st, 1974 to April 1st, 1975 are contained in my separate reports, copies of which are attached.

Since April I have continued with my analysis of the literature that I have obtained, documented and classified the various interviews and informal meetings that I have had and prepared preliminary drafts of my paper.

In May and early June I undertook a trip to the Far East, particularly the Philippines, Indonesia and Singapore where I visited a variety of projects and spoke to many people involved in the construction of these and other construction activities. I obtained their comments, views and ideas as to how the management of these operations can best be administered.

In the Philippines I spent a majority of my time investigating the programme of labour-intensive road construction that the Bureau of Public Highways are undertaking. I received the utmost co-operation from the officials of that organization, visited the site of their pilot project in Central Luzon and was able to spend a lot of time discussing this facet of construction with the administrators, engineers and supervisors concerned.

Also while in Manila, I had meetings with representatives of consulting engineering companies responsible for various water supply projects, both urban and rural, in the Philippines. These indigenous organizations have a different approach in many cases to the expatriate and multi-national organizations with whom I had previously discussed my field of interest.

In Indonesia and Singapore I was particularly interested in the changes that have taken place in the administration of construction projects in the 17 years since I myself had worked in the area. In both countries I visited construction projects and discussed with those concerned the problems facing them in their augmentation. It was also interesting to note the different approaches used in these two countries, physically so close and yet so different in attitudes, levels of development and organizational approach.

On this visit, as well as those to other countries. it is not only the formal visits to construction projects and interviews with the people involved that have provided valuable information, but also the informal watching of construction activities, large and small going on alongside the road, or visible from the hotel room, that have yielded valuable insight into methods and organizational procedures.

During the summer months I had intended to make a combined holiday/working visit to certain Central American countries, particularly San Salvadore where I have some contacts in the construction industry. For personal reasons it became impractical to make this a family holiday. I considered making the trip myself, however, as I had been particularly unlucky in making additional contacts in the area, I decided to cancel this trip in favour of one to Washington, D.C. and Ottawa.

During my previous visit to Washington I had received much information, advice and encouragement from various people within the World Bank, the Pan-American Health Organization and others. These people had suggested that, prior to my submitting my final report, I should let them read it and give me their comments. I had had similar help and encouragement from various people within C.I.D.A. in Ottawa where I also had many contacts. I had originally intended to send these people copies of my rough draft by mail, but as my trip to Central America did not appear to be very fruitful, I took the opportunity of delivering drafts of my report to these various people, discussing and explaining my findings with them directly.

The latter part of my period of tenure was spent in final organization of the material I had gathered and in writing Part II of this report - a paper entitled "Minimum Cost - Minimum Time". The object of this paper is not so much to revolutionize the development construction industry, but rather to set up what appears to me to be the most economical and practical method of constructing these development projects.

I have been most fortunate in being able to obtain both the official positions and unofficial views of many people involved in development construction during my period of tenure. These views together with my own experiences and results of reviewing the limited literature that is available on the subject constitute the basis of my paper. I am very grateful to these many people for help and encouragement.

Since I have distributed copies of my draft I have received much constructive criticism on the paper and this criticism is summarized, together with my comments on it, in an addendum to the paper.

B. Study Programme I

As part of my personal education programme, I had originally intended to take a formal course in political science in the field of development aid. However, I found that such a course was not being offered by either of the universities in the Vancouver area that year. After discussion with the head of the Department of Political Science at the University of British Columbia, I decided that I would attend a course given by his department in public administration. He and I felt that this would give me an opportunity to study and perhaps better understand the problems of government administrators with whom I am increasingly coming in contact in all development projects.

Although this course was not specifically geared to the administrative systems in developing countries, being naturally more involved with the Canadian scene, the theoretical and practical analysis of civil service administrative bureaucracies appears in many instances to be universal.

From a personal point of view, I found it most enlightening that these matters, to which I had for many years been exposed, had a formal theory and that its practise subject to involved analysis rather than day-to-day expediency.

Both in the formal lectures, required reading and the informal discussions associated with the course, I was able to broaden my experience in this field. I consider that this study programme was extremely worthwhile.

C. Study Programme II

During the early part of 1975 I enrolled in an evening course in Conversational Spanish given by the North Vancouver School Board. The primary object of attending this course (which was very elementary in nature) was to give me some rudiments of the language for my proposed trip to Central America in the summer. As this trip did not materialize, the immediate opportunity to make use of this knowledge was not tested.

Not being in any way adaptable to new languages it is doubtful whether I have gained any fluency in Spanish; I have, however, had the opportunity of being exposed to a language that I had not previously come in contact with, which in the future may be used as a base for further study.

Report for Period Oct. 1 to Dec. 1, 1974

General

Much of the time during the first two months of tenure has been spent on organizational matters and getting my programme in order, and setting down in writing my preconceptions on the subject.

I have obtained the "sponsorship" of Dr. S. Cherry of the Department of Civil Engineering at the University of British Columbia, where I have registered as a special student. This gives me the use of the university library and other facilities.

A. Research Programme

The period has been spent on the following projects:

- a) Identification of bibliography on the area of research and obtaining necessary book lists, identifying and obtaining literature.
- b) Identification of personnel within development agencies, private organizations and individuals with whom interviews would be worthwhile. Correspondence and arranging meetings with these people.
- c) Identification of projects in the Caribbean, the Far East and Central America which I wish to visit during field trips and obtaining necessary permission.
- d) A detailed study of some literature which I have been able to obtain from the World Bank in the field of labour-intensive construction, the construction industry in developing countries and the design of rural water supplies.
- e) Identifying and tabulating my own experiences with the problems of construction on development projects more or less along the lines in the "Areas of study" contained in the Terms of Reference handed to the Centre on September 24, 1974.
- f) Reading in the libraries in Vancouver and at the University of British Columbia on the general philosophy of development aid.

As an extension of a) and b) above I have arranged to visit various organizations, companies, libraries and individual consultants in Ottawa, Montreal, New York, Philadelphia, Washington D.C. and Boise. A trip to these places will be made during late November and early December.

Work on all the above projects is continuing.

B. Study Programme (1)

After discussing my particular wishes with Professor Wallace, head of the Department of Political Science at the University of British Columbia, I have undertaken a very general study of political science with regard to international development.

This programme consists of taking an undergraduate course in Public Administration and also doing independent reading under the direction of the Department into the international political implications of development aid.

I hope after the new year to expand my activities, if time permits, and "audit" certain post-graduate courses on Asian and Latin American government systems.

My original intention to take formal attendance at a post-graduate seminar on International Relations Theory had to be abandoned, as these seminars proved to be too specialized and in fields not related to international development.

C. Study Programme (2)

Owing to the late date at which I returned to Vancouver, I have been unable to register in any formal course in Conversational Spanish; however, this will be undertaken in the new year.

David G. Hunter, Research Associate Award 1974-75.

Report for Period Dec. 1, 1974 to Apr. 1, 1975.

The past four months of the tenure period have been spent in (a) obtaining and studying literature, (b) corresponding with interested parties and (c) making field trips with regard to my area of research. I have also continued with my study course at the University of British Columbia and taken a night class in elementary conversational Spanish.

A. Research Programme

The period has been spent on the following projects:

(a) Obtaining copies of the available literature covering my area of research from libraries, bookshops and development agencies. Where possible I have attempted to borrow these, however, in the majority of cases it has been necessary to buy copies or have xerox copies made. I have been particularly lucky in obtaining copies of unpublished "working papers" from such organizations as the World Bank and the International Labour Office.

9 (b) Studying, tabulating and summarizing the literature obtained in (a) above.

✓ (c) Carrying out interviews with consulting, design and construction engineers in the Vancouver area who have had experience in the augmentation of development projects overseas and entering into correspondence with various people around the world interested in my field of study.

(d) Field trips to Ottawa, New York, Washington D.C., Philadelphia, Boise and Jamaica to interview people within development organizations and private companies and, in the case of Jamaica, to visit construction sites. I have been given particular help in this regard by the personnel of the World Bank and the Pan American Health Organization. I had originally intended to visit Haiti and Dominica during my trip to the Caribbean, however, due to a variety of reasons this was not done.

(e) Tabulating the results of the interviews and visits carried out in (c) and (d) above, and comparing with the results obtained from (b) above.

(f) Continuing general reading in available literature on the general philosophy of development aid.

Work on all the above is continuing and I intend to make further field trips to the Far East and Central America during the next six months.

During the first half of my study period I have realized that my original terms of reference encompassed too large a field

to try researching in depth. This was due largely to my own original ignorance of the amount of research done in some fields (such as labour-intensive construction) and the lack of work in others (the administrative bureaucracy involved in construction). There has been a temptation to narrow my field of study, so as to carry out an in-depth evaluation of existing work or to do some basic research into a neglected field; however, as the main object of programme has always been to broaden my experience and because the limited resources available would not do justice to a detailed study, I have decided to maintain my original broad terms of reference and to ascertain the present "state of the art" in the various subjects covered and to try and correlate the problems associated with these.

B. Study Programme (1)

I have continued over the last four months attendance at a course in Public Administration given by the Department of Political Science at the University of British Columbia except while away from Vancouver on field trips. This course will be complete in April.

Though not specifically geared to public administration in developing countries, this course has been most informative and interesting, as it has presented to me the theoretical thinking behind bureaucratic administration and, perhaps, made me more aware of the problems faced by such organizations.

C. Study Programme (2)

During the past three months I have attended a night school course in elementary conversational Spanish and, though I am far from fluent in the language, it has given me a basis on which to expand my competence.

ORGANIZATIONS & PERSONS INTERVIEWED OR WITH WHOM
CORRESPONDENCE HAS BEEN UNDERTAKEN DURING PERIOD OF TENURE

A. International Development Organizations

1. International Bank for Reconstruction & Development,
Washington, D.C.
C. Weiss, W.G. Donovan, I.K. Sud, D. Ahmad, R. Venkateswaran,
D. Cook, J.A. King, G. Harral, C. Hardy, H. Shipman, S. Basta,
P. Patel, H. Singh, W. McCulloch, W. Armstrong, A.E. Bruestle,
J.R. Lethbridge.
2. United Nations, New York.
J. Bradanovic, H. Piche, M. Harris, R.K. Basu, F.C. Downes-
Thomas.
3. United Nations, Kingston, Jamaica.
J. Thomas.
4. Asian Development Bank, Manila.
D. Singh, L.A. Hayashi.
5. Canadian International Development Agency, Ottawa.
W.R. Ronberg, A. Wheatley, M. Baron, J. Godsell.
6. International Labour Office, Geneva.
G.A. Edmonds.
7. Pan American Health Organization, Washington, D.C.
D. Donaldson, S. Serdahely.
8. Organization of American States, Washington, D.C.
C. Sanuda, D. Heft.

B. Government & Quasi government Augmenting Organizations

1. Bureau of Public Highways, Manila.
A.S. Tabamo, P.S. Gayya, B. Aquino, C. Reveria, J. Morfe.
2. Karnataka Land Army Corporation Ltd., Bangalore.
Brig. V.P. Naib.
3. Metropolitan Waterworks & Sewage System, Manila.
O.I. Ilustre.

4. National Urban Development Corp., Jakarta.
G.W. Handojo, S. Sayono.
5. Public Work Department, Singapore.
L.G. Lim.
6. Ministry of Housing, Jamaica.
D. Golding, J. Ladley, D. Kirkpatrick.
7. Urban Development Corporation, Jamaica.
J. Allgrove.
8. Public Work Dept., Jamaica.
S.G. Williams.
9. National Water Authority, Jamaica.
A. Nembhard, L. Lawson, C. Davis.
10. Ministry of Communications & Works, Dominica.
W. Lawrence.

C. Consultants.

1. Engineering and Development Corporation of the Philippines, Manila.
L.P. Trinidad, H. Jovellanas.
2. DCCD Engineering Corporation, Manila.
P.C. Reyes, J. Ramas, M.D. Zabat.
3. Swan Wooster Engineering Co. Ltd., Jakarta.
F. Culbert, W. Allan.
4. Renardet (Singapore) Ltd., Singapore.
D.E. Cox.
5. Wallace, Evans & Partners, San Salvador.
G. Stevenson.
6. Wallace, Evans & Partners, Jamaica.
P. Hughes.
7. Price, Fisher, Tomlinson & Associates, Jamaica.
S. Price.

8. E.D. Winch & Associates, Jamaica.
E.D. Winch.
9. Meltis, Demain, Beckford Assoc., Jamaica.
H. Beckford.
10. Jantech Consultants Ltd., Jamaica.
L. Lawrence.
11. Planning & Development Collaborative International,
Washington, D.C.
A.P. Van Huyck.
12. Swan Wooster Engineering Co. Ltd., Vancouver.
J. Merchant.
13. Associated Engineering Services Ltd., Vancouver.
J.E.C. Wollett.
14. Walter Cosinuke & Assoc., Philidelphia.
15. Arthur D. Little Inc., Cambridge.
C. Bliss.

D. Contractors

1. Morrison, Knudson International Co., Boise.
D. Tefers, R.E. Reed, N. Spencer, J. Erdle.
2. Framhill Construction Ltd., Jamaica.
R. Hilton.
3. Commonwealth Construction Co., Vancouver.
G. Ellis.

E. Other Government Organizations

1. Dept. of Trade & Commerce, Ottawa.
M. Smith.

F. Others involved in International Development Construction.

1. Brig. J. Bishop, Vancouver.
2. Prof. W.P. Strassman, East Lansing.
3. K.C. Macleod, Vancouver.
4. S.G. Revay, Montreal.
5. Prof. Koenigsberger, London.
6. R. Dick, Vancouver.
7. A. van Huyck, Washington, D.C.
8. W. Cosinuke, Philadelphia.

B I B L I O G R A P H Y

INTERNATIONAL CONSTRUCTION

An Easy Approach to Economy Studies for Public Works Projects	Joseph B. Franzini	Public Works Magazine May, 1962
A Land Army Project in Karnaka India	W. Graeme Donavan	Development Digest Vol. 2 No. 4 1973
Earthmoving by Manual Labour and Machines	-----	U.N. Bangkok 1961
Framework for the Promotion of Construction Industries in the Developing Countries	John C. deWilde and Assoc.	I.B.R.D. Wash., D.C. 1973
Iron Deficiency Anemia and the Productivity of Adult Males in Indonesia	S.S. Basta A. Churchill	I.B.R.D. Wash., D.C. 1974
Kenyan Building Contractors: Practices, Problems and Needs	-----	Int. Tech. Grant London 1970
Land Army in Karnataka	-----	Bangalore 1974
Methodology for Achieving Cost Reductions in Public Construction the Columbia Phase - --Report to U.S.A.I.D.	-----	Arthur D. Little Inc. Cambridge, Mass. 1972
Nigerian Building Contractors: Practices, Problems and Needs	-----	Int. Tech. Group London 1970
Notes on the Working of the Land Army in Mysore State	-----	Bangalore 1974
Nutrition and Health of Indonesia Construction Workers: Endurance and Anemia	Darwin Karyadi, S.S. Basta	I.B.R.D. Wash., D.C. 1973
Rural Works & Employment - Description on Preliminary Analysis of a Land Army Project in Mysore State	W. Graeme Donavan	Cornell University 1973

LABOUR INTENSIVE PROJECTS

A Field Manual for the Collection of Productivity Data from Civil Construction Projects	-----	I.B.R.D. Wash., D.C. 1975
Choice of Technology for Employment Promotion	M.A. Misir	I.L.O. Turin 1975
Comparison of D. Pherert Modes of Haulage in Earthworks - Substitution of Labour for Equipment in Civil Construction	-----	I.B.R.D. Wash., D.C. 1975
Construction of Roads by Labour Intensive Methods	-----	U.N. New York 1974
Labour Intensive Road Construction in Pakistan	Iqtidar A. Chaudhri	I.L.O. Turin
Men or Machines	Deepak Lal et al	I.L.O. Geneva 1974
Productivity Rates of Earthmoving Machines - Substitution of Labour for Equipment in Civil Construction	-----	I.B.R.D. Wash., D.C. 1975
Reducing Cost and Improving Performance in Construction of Public Works	-----	Rep. of Philippines Dept. Public Highways Manila, 1974
Report on First Road Demonstration Project - Substitution of Labour for Equipment in Civil Construction	-----	I.B.R.D. Wash., D.C. 1975
Roads and Redistribution	-----	I.L.O. Geneva no date
Study of the Substitution of Labour and Equipment in Civil Construction Phase 2 Final Report Volumes 1, 2 & 3	Scott, Wilson Kirkpatrick & Partners	I.B.R.D. Wash., D.C. 1974

LABOUR INTENSIVE PROJECTS (Continued)

Study of the Substitution of Labour for Equipment in Road Construction-Summary and Conclusions Phase 1	-----	I.B.R.D. Wash., D.C. 1971
Technology and Employment in the Peoples Republic of China	Genevieve C. Dean	I.L.O. Turin 1975

PROJECT EVALUATION AND ADMINISTRATION

Administration of Development Programmes and Projects: Some Major Issues	-----	U.N. New York 1971
Administrative Machinery	-----	U.N. New York 1969
Appraising Administrative Capability for Development	-----	U.N. New York 1969
Coming Changes in Construction Management	-----	Engineering Journal March, 1973
Employment and Development: A Comparative Analysis of the Role of Public Works Programs	John Thomas et. al.	I.B.R.D. Washington, D.C. 1975
Evaluating Development Projects	Samuel Hayes, Jr.	UNESCO Paris 1959
Interdisciplinary Study of Project Appraisal in the Context of a Developing Country	L. Wolofsky	I.D.R.C. Ottawa 1973
Management Handbook for the Nigerian Building Contractor, A	-----	Int. Tech. Group London no date
Project Performance Audit Report on Jamaica First Education Project	-----	I.B.R.D. Washington, D.C. 1975
The Will to Manage	Marvin Bower	McGraw Hill Inc. New York 1966
Some Management Problems in Running an Autonomous Government Corporation in a Newly Independent African Territory	G. E. Wyatt	-----
Making Project Management Work	J. M. Stewart	Business Horizons

HIGHWAYS

Achievement of Opportunities to Reduce Construction Costs in Public Highways, Volumes 1 & 2	-----	Bureau of Public Highways Manila 1973
A Cost Comparison Study of Force Account and Contract Construction on Five Secondary Projects in North Carolina	F. B. Farrel et. al	N.R.C. Highway Research Board Proc. 1956 35th Annual Meeting
Appraisal Methodology for Feeder Road Projects	Arturo Israel	I.B.R.D. Washington, D.C. 1970
A Review of 62 Road Projects Appraisal Reports, 1960-66	Jan de Weille et. al	I.B.R.D. Washington, D.C. 1967
Highway Cost Performance Model	C. G. Harral	I.B.R.D. Washington, D.C. 1970
Highway Design Study Phase 1: The Model	Fred Moavenzadenl et. al	I.B.R.D. Washington, D.C. 1971
Selection of Road Projects and the Identification of the Appropriate Road Construction Technology: General Consideration	Moise Allal	I.L.O. Geneva 1975
The Role of Design in the Choice of Road Construction Techniques	G. A. Edmonds	I.L.O. Geneva 1975

WATER SUPPLIES & SEWAGE

A Bibliography of Low-Cost Water Technoligies	G.H. Bateman	Int.Tech. Group London 1974
Community Water Supply	-----	World Health Organization Geneva 1969
Community Water Supply in Developing Countries	Frederick E. McJunkin	Agency for Int. Development Wash., D.C. 1969
Engineering Management of Water Supply Systems	-----	U.S.A.I.D. Hua Hin Thailand 1961
Report on Global Urban Water Supply Program Costs in Developing Nations	John M. Henderson	Int. Coop. Administration Wash., D.C. 1961
Report of the Panel of Expert Consultants to The International Cooperation Administration on the Community Water Supply Development Program	-----	Int. Coop.Admin. Wash., D.C. 1960
Sewage Lagoons for Developing Countries	-----	Agency for Int. Development Wash., D.C. 1966
Sewage Stabilization Ponds in Africa	Arthur E. Williamson	Int. Coop. Admin. Salisbury 1960
Technology Assessment and Research Priorities for Water Supply and Sanitation in Developing Countries	-----	Int. Dev. Centre Ottawa 1973
Thailand's Water-Seal Privy Program	Barry Karlin	Thailand 1961

WATER SUPPLIES & SEWAGE (Continued)

Village Water Supply and Sanitation in Less Developed Countries	-----	I.B.R.D. Wash., D.C. 1974
Water Supply Case Studies and Work Exercises Volumes 1 & 2	-----	I.B.R.D. Wash., D.C. 1973
Water Supply for Rural Areas and Small Communities	Wagner & Lanoix	W.H.O. Geneva 1959
Water Treatment and Sanitation: Simple Methods for Rural Areas	-----	Int. Tech. Group London 1973

HOUSING, SITES AND SERVICES

Appraisal of the Jakarta Urban Development Project in Indonesia	-----	I.B.R.D. Wash., D.C. 1974
Cost-Effects, Risks, Some Conclusions About Complexity, and Origins of Building Innovations	W. Paul Strassman	I.L.O. Geneva 1974
Equity, Growth, and Housing Policy for Less Developed Countries	W. Paul Strassman	Michigan State University no date
Industrialised Systems Building for Developing Countries: A Discouraging Prognosis	W. Paul Strassman	I.L.O. Geneva 1974
Innovations in Building Methods and Employment in Puerto Rico	W. Paul Strassman	I.L.O. Geneva 1973
Jamaica Appraisal of a Sites and Services Project	-----	I.B.R.D. Wash., D.C. 1974
Manual on Building Construction	Rev. H.K. Dancy	Int. Tech. Group London 1973
Manual on Self-Help Housing	-----	U.N. New York 1964
Modular Co-ordination in Building Asia, Europe, Americas	-----	U.N. New York 1966
Modular Co-ordination of Low-Cost Housing	-----	U.N. New York 1970
Pilot Housing Project in Central America	-----	U.N. New York
Survey and Analysis of Urbanization Standards and on-Site Infrastructure	-----	I.B.R.D. Wash., D.C. 1974
Trends in the Industrialization of Building	-----	U.N. New York 1970

MANPOWER AND TRAINING

Skilled Manpower Demand Projections for Irrigation Projects in Northwest Mexico	I. Haissman	I.B.R.D. Washington, D.C. 1970
The Development of Engineering Design Capabilities in Developing Countries	-----	U.N. New York 1972
The National Construction Corp., Kenya; A Study of an African Contractor Training Organization	-----	Int. Tech. Group London no date
Technology and Employment in Industry	-----	I.L.O. Geneva 1975
Unproductive Time in Building Operations	S. Peer et. al	Commonwealth Scientific & Industrial Research Organization Australia 1971

CONSTRUCTION MATERIALS

Cement's Little Brother Shows
Indian Promise

Sam Wade

New Civil Engineer
March 1974

Soil-cement: Its Use in Building

U.N.
New York
1964

The Use of Bamboo and Reeds in
Building Construction

U.N.
New York
1972

Timber Trusses Fill Gaps in Kenya

Mike Muller

New Civil Engineer
June 1974

APPROPRIATE TECHNOLOGY

Application of Social Cost-Benefit Analysis to the Identification of the Most Appropriate Construction Technology	M. Allal	I.L.O. Turin 1975
Application of Appropriate Technology Choice	Ton de Wilde	I.L.O. Turin 1975
Appropriate Technology Vol.1, No.3	-----	Int. Tech. Group London 1974
Appropriate Technology Vol.1, No.4	-----	Int. Tech. Group London 1974
Appropriate Technology Vol.2, No.1	-----	Int. Tech. Group London 1975
Appropriate Technology and Research for Industrial Development	-----	U.N. New York 1972
Appropriate Technology in Construction	-----	I.L.O. Geneva 1974
Intermediate Technology: Plugging the Development Gap	Derek Miles	New Civil Engineer 1973
Old-Fashioned But Still Good	Geo. R. Osland	The American City New York 1961
Philosophy Purpose People Panels Programme Publications	-----	Int. Tech. Group London no date
Transfer of Operative Technology at the Enterprise Level	-----	U.N. New York 1972

STATISTICS

Construction Statistics

U.N.
New York
1965

International Recommendations for
Construction Statistics

U.N.
New York
1968

MISCELLANEOUS

A Soldier Looks at National Planning	Brig. V. P. Naib	-----
Engineering, Man and Nature	Anthony B. Hall	Jamaica 1972
Second Hand Equipment in a Developing Country	Charles Cooper et. al	I.L.O. Geneva 1975
Standardization	-----	U.N. New York 1969
The Point of the Lance - The Construction Resident on Overseas Construction	David Donaldson	AWWA Conference Denver, Colo. 1971